



**DEPARTMENT OF THE AIR FORCE**  
**HEADQUARTERS AIR FORCE CIVIL ENGINEER SUPPORT AGENCY**

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FROM: AFCESA/CES  
139 Barnes Drive, Suite 1  
Tyndall AFB, FL 32403-5319

SUBJECT: **Engineering Technical Letter (ETL) 02-12: Communications and Information System Criteria for Air Force Facilities**

**1. Purpose.** This ETL integrates communications and real property planning, programming, and construction. It supersedes draft ETL 01-17. It is a joint effort of Headquarters Air Force Civil Engineer Support Agency (HQ AFCESA) and Headquarters Air Force Communications Agency (HQ AFCA) with HQ AFCA coordination. It supports Air Force initiatives such as Gigabit Ethernet, network consolidation, and the Air Force Portal by establishing the following requirements:

- New facilities and facility alterations acquired with military construction (MILCON) appropriations will have common-user communications and information system infrastructure, including connectivity.
- Communications and information infrastructure and connectivity will be integrated into facility planning, programming, design, and construction to ensure the system is complete and ready for customer occupancy.
- Systems will comply with the requirements of Air Force Instruction (AFI) 33-133, *Joint Technical Architecture* (Joint Technical Architecture – Air Force [JTA-AF]) and basic standards to ensure compatibility, flexibility, and long-term customer support.

**1.1. Intent:**

- Minimize user occupancy delays and provide immediate network services on the facility occupancy date.
- Prevent facility defacement that would occur if communications and information infrastructure were not integrated into the facility design and acquisition process.
- Provide flexibility and standardization, thereby reducing the need and cost of future modifications that would result from changes in facility occupancy or user reorganization.
- Alleviate funding disconnects that result from fragmenting appropriations sources for MILCON and communications equipment infrastructure funding.

**1.1.1. Scope.** In each MILCON appropriations-funded project, military family housing (MFH) MILCON-funded project, or MILCON level Base Realignment And Closure (BRAC) project, include all common-user telephone and local area networks (LAN) (both Non-secure Internet Protocol Router Network [NIPRNET] and Secure Internet Protocol Router Network [SIPRNET]) infrastructure requirements to accommodate

connecting operational and administrative end-user equipment. This includes, but is not limited to, the following:

- Customer jacks (telephone, fax, LAN, pay phone, community access [cable] television [CATV])
- All wiring, cabling, fiber optic cables (FOC), conduits, ducts, manholes, and pathways from the customer's jacks to the point where the new facility will receive network services (dial tone and Internet protocol access)
- Connectivity for facility energy monitoring and control systems (EMCS) and fire alarm systems
- Entry control, intrusion detection, antiterrorism/force protection, and alarm system wiring infrastructure and components such as card readers and magnetic locks (monitors, cameras, and scanners are excluded)
- Termination devices (cross-connects, patch panels, distribution frames, network protectors)
- Communications equipment rooms (CER), closets, and other pathways
- Provisions only (e.g., floor space, electrical/mechanical utilities, ducts, and other real property improvements and fixtures) for special-purpose equipment, such as secure switches, radio transmitters, and audio-visual equipment
- Access floor systems
- Communications and information infrastructure requirements other than equipment when validated in advance and supported by the major command (MAJCOM) for inclusion into the military construction program (MCP) project's programming documentation
- Permanently installed standby power (real property installed equipment [RPIE]) generators when justified
- Associated MILCON planning and design

**1.1.2. Excluded.** The following items will not be funded with MILCON appropriations. They will continue to be funded from appropriate 3400 (Operation & Maintenance, Air Force) or 3080 (Air Force Procurement [Equipment]) funds, as required by AFI 65-601, *Budget Guidance and Procedures*, Volume 1.

- End instruments (telephones, secure telephone units [STU], secure terminal equipment [STE], computers, printers, video projectors, scanners, fax machines, copiers) and installation
- Terminations of building wiring infrastructure at equipment or onto existing base networks
- Special-purpose equipment (e.g., secure switches, radio transmitters, and audio-visual equipment) and installation
- Prewired work stations or furniture systems and installation
- Switching equipment (telephone switches, additional telephone central office line cards, and LAN switches) and installation
- Optical carrier equipment and installation
- CATV amplifiers and splitters which will be government-owned
- Network servers, routers, and hubs and installation

- Encryption equipment for classified systems and installation
- Power conditioning equipment such as uninterruptible power supplies (UPS) and installation
- Associated system engineering for items identified in this paragraph

**1.2.** Communications and information wiring infrastructure bought with construction appropriations in MILCON projects as part of the facility design and construction process will not be classified as real property or RPIE for accountability, ownership responsibility, operations and maintenance (O&M), upgrade, or replacement financing purposes.

**1.3.** Since communications and information infrastructure will be acquired with MILCON appropriations that are line-item-appropriated by Congress, no other appropriation will be used to augment their initial acquisition and installation. Furthermore, they are subject to the prohibition on alterations within one year from the date of beneficial occupancy in accordance with paragraph 3.4.2 of AFI 32-1032, *Planning and Programming Appropriated Funded Maintenance, Repair, and Construction Projects*.

**2. Summary of Revisions.** This ETL supersedes ETL 87-9, *Prewiring*. It updates requirements and standards consistent with current technology, incorporates decisions significantly expanding the scope of the superseded ETL, incorporates changes in funding and management policies, and reflects present organizational alignments.

**Note:** This ETL substantially revises ETL 87-9 and should be completely reviewed.

**3. Application.** Requirements of this ETL are mandatory for all MAJCOMS and their installations.

**3.1.** MCP. Compliance with this ETL is mandatory for all new construction, renovation, modernization, or rehabilitation work financed through Military Construction Appropriation Acts beginning in fiscal year (FY) 2004 on Air Force installations both inside and outside the United States of America. Technical requirements also apply for any “official service” authorized and provided in non-appropriated fund (NAF) facilities.

**3.2.** O&M-Funded Projects. The technical requirements of this ETL apply to O&M-funded facility projects; however, only those elements of a project that are real property subject to construction statutory funding limits (see AFI 32-1032) will be financed with funds appropriated for minor construction, repair, minor renovation, or maintenance. Elements of a project that are not real property, such as communications wiring, and termination devices, will be funded as an expense (Element of Expense Code [EEIC] 592, 6XX, as appropriate) in accordance with AFI 65-601, *Budget Guidance and Procedures*, Volume 1.

**3.2.1.** The MAJCOMs will program communications infrastructure requirements including real property elements of work, such as walls, conduit, trenching, backfilling, and manholes, associated with non-MILCON sustainment, restoration, and

modernization construction projects in the appropriate MAJCOM Engineering and Installation (E&I) account or the Combat Information Transport System (CITS) account (see AFI 65-601V1, paragraph 8.21).

**3.2.2.** The implementing command will program all real property elements of work, such as walls, conduit, trenching, backfilling, manholes (so-called “allied support construction”) for non-MILCON projects supporting major communications and information infrastructure programs in the major program’s Program Element (PE) in accordance with AFI 65-601V1, paragraph 8.21 and Figure 7.1, item 6b. This includes contracted architectural and engineering services for these projects in accordance with AFI 65-601V1, paragraph 7.6.10.2.

**3.3.** Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) and other mission equipment, cabling, antennas, and other appurtenances that are part of a mission system, such as satellite communications earth stations, (usually centrally managed by an implementing command system program office) will continue to be managed and funded as acquisition programs in accordance with DOD 5000-2-R, *Mandatory Procedures for Major Defense Acquisition Programs (MDAPS) and Major Automated Information System (MAIS) Acquisition Programs*. The system program office will coordinate supporting construction requirements with the MAJCOM sponsoring the MILCON project so those construction requirements are included. Where supporting construction is non-MILCON, the system program office will coordinate requirements with the host command and fund them in accordance with paragraph 3.2.2.

**3.4.** Upgrades. Do not use this ETL to justify upgrading existing facilities. The decision to upgrade facility communications and information systems will be based on mission need or economics and approved by the wing commander or higher authority, in accordance with MAJCOM policy.

**3.5.** Authority: AFI 32-1021, *Planning and Programming of Facility Construction Projects*, and AFI 32-1023, *Design and Construction Standards and Execution of Facility Construction Projects*.

**3.6.** Effective Date: Immediately.

**3.7.** Ultimate Recipients:

- MAJCOM and base communications systems officers (BCSO)
- MAJCOM and base systems telecommunications engineering managers (STEM) at 38 Engineering Installation Group (EIG), Tinker Air Force Base, Oklahoma
- MAJCOM and base civil engineers (BCE)
- Design and construction agents

**3.8.** Coordination:

- The Air Force Civil Engineer (HQ USAF/ILE)

- Director of C4ISR Infrastructure (HQ USAF/XIC)
- MAJCOM Civil Engineers (CE) and MAJCOM Directors of Communication and Information (SC)
- 38 EIG

**3.9. Waivers.** Coordinate requests for waiver of technical requirements on a case-by-case basis through the BCSO, BCE, STEM, and MAJCOM/SC before submitting to the MAJCOM/CE. Notify requestor and all coordinating parties of approval or disapproval. Commands will not issue blanket waivers unless required to meet specific host country technical requirements. Requirements affecting financing, budget, or the ability to meet the intent of delivering a complete and usable communications and information system upon completion of facility construction will not be waived.

**4. Referenced Publications.** The latest editions of the following publications apply:

**4.1. Public Law (PL):**

- PL 106-52, *Military Construction Appropriations Act 2000*, 17 August 1999

**4.2. Department of Defense (DOD):**

- DOD 5000-2-R, *Mandatory Procedures for Major Defense Acquisition Programs (MDAPS) and Major Automated Information System (MAIS) Acquisition Programs*
- DOD 7000.14-R, *DOD Financial Management Regulation*

**4.3. Air Force:**

- AFI 21-404, *Developing and Maintaining Communications and Information Systems Installation Records*
- AFI 32-1021, *Planning and Programming of Facility Construction Projects*
- AFI 32-1023, *Design and Construction Standards and Execution of Facility Construction Projects*
- AFI 32-1032, *Planning and Programming Appropriated Funded Maintenance, Repair, and Construction Projects*
- AFI 33-104, *Base Level Planning and Implementation*
- AFI 33-111, *Telephone Systems Management*
- AFI 33-115, *Network Management, Volume 1*
- AFI 33-133, *Joint Technical Architecture - Air Force*
- AFI 65-601, *Budget Guidance and Procedures, Volume 1*
- *The USAF Project Manager's Guide for Design and Construction* (available at <http://www.afcee.brooks.af.mil/dc/products/pmguide/pmguide.asp>)
- Air Force Housing Design Guides (a list is available at [http://www.afcee.brooks.af.mil/dc/dcd/arch/designdb/dsgn\\_guidelist.xls](http://www.afcee.brooks.af.mil/dc/dcd/arch/designdb/dsgn_guidelist.xls))
- *Air Force Visiting Quarters Design Guide* (available at <https://www-r.afsv.af.mil/ld/documents/vqdesgd18aug2.doc>)
- JTA-AF (available at <https://www.afca.scott.af.mil/jta-af>):
  - JTA-AF, *Building Wiring Architecture*

- JTA-AF, *Voice Switching Systems Architecture*
- JTA-AF, *Information Technology Infrastructure Architecture*
- JTA-AF, *Local Area Network Architecture*

**4.4. American National Standards Institute/Telecommunications Industry Association/Electronics Industries Alliance (ANSI/TIA/EIA):**

- TIA/EIA-568-B, *Commercial Building Telecommunications Cabling Standard*
  - TIA/EIA-568-B.1, *Part 1: General Requirements*
  - TIA/EIA-568-B.2, *Part 2: Balanced Twisted-Pair Cabling Components*
  - TIA/EIA-568-B.3, *Part 3: Optical Fiber Cabling Components Standard*
- TIA/EIA-569-A, *Commercial Building Standards for Telecommunications Pathways and Spaces*
- TIA/EIA-570-A, *Residential Telecommunications Cabling Standard*
- TIA/EIA-606, *Administration Standard for the Telecommunications Infrastructure of Commercial Buildings*
- TIA/EIA-607, *Commercial Building Grounding and Bonding Requirements for Telecommunications*
- TIA/EIA-758, *Customer-Owned Outside Plant Telecommunications Cabling Standard*

**4.5. National Fire Protection Association (NFPA):**

- NFPA 70, *National Electrical Code*

**5. Additional References:**

**5.1. Air Force:**

- AFI 32-1022, *Planning and Programming Nonappropriated Fund Facility Construction Projects*
- AFI 32-1065, *Grounding Systems*
- AFI 32-1084, *Facility Requirements*
- AFI 32-6002, *Family Housing Planning, Programming, Design, and Construction*
- AFI 32-6003, *General Officer Quarters*
- AFI 33-103, *Requirements Development and Processing*
- AFI 34-105, *Programming for Nonappropriated Fund Facility Requirements*
- AFI 64-101, *Cable Television Systems on Air Force Bases*

**5.2. NFPA:**

- NFPA 101, *Life Safety Code*
- NFPA 780, *Standard for the Installation of Lightning Protection Systems*

**5.3. ANSI/TIA/EIA:**

- TIA/EIA 526-7 (OFSTP-7), *Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant*

- TIA/EIA 526-14 (OFSTP-14), *Optical Power Loss Measurements of Installed Multi-mode Fiber Cable Plant*

#### 5.4. DOD:

- *DOD Joint Technical Architecture (JTA)* (available to .mil users at <http://www-jta.itsi.disa.mil/>)

### 6. Acronyms.

AAFES	- Army & Air Force Exchange Service
AFEMS	- Air Force Equipment Management System
AFI	- Air Force Instruction
AFMC	- Air Force Material Command
ANSI	- American National Standards Institute
ATM	- asynchronous transfer mode
AWG	- American Wire Gauge
BCE	- base civil engineer
BCSO	- base communications systems officer
BET	- building entrance terminal
BICSI	- Building Industry Consulting Services International
BRAC	- Base Realignment And Closure
C4ISR	- Command, Control, Communications, Intelligence, Surveillance, and Reconnaissance
CAN	- campus area network
CAT	- category
CATV	- community access (cable) television
CCTV	- closed circuit television
CER	- communications equipment room
CITS	- Combat Information Transport System
CSIR	- Communications and Information System Installation Records
E&I	- Engineering and Installation
EEIC	- Element of Expense Investment Code
EIA	- Electronic Industries Alliance
EIG	- Engineering Installation Group
EMCS	- energy monitoring and control system
ETL	- Engineering Technical Letter
FOC	- fiber optic cable
FY	- fiscal year
GOQ	- general officer quarters
GSA	- General Services Administration
HQ AFCESA	- Headquarters Air Force Civil Engineer Support Agency
HQ AFCA	- Headquarters Air Force Communications Agency
HQ AFSVA/SVOHL	- Headquarters Air Force Services Agency, Lodging Department
HQ USAF/ILE	- The Air Force Civil Engineer
HQ USAF/XIC	- Director of C4ISR Infrastructure (formerly HQ USAF/SC)
ICEA	- Insulated Cable Engineers Association

IPMS	- Information Processing Management System
IPT	- Integrated Process Team
ISDN	- Integrated Services Digital Network
ITN	- information transfer node
JTA-AF	- Joint Technical Architecture - Air Force
LAN	- local area network
MAJCOM	- major command
MCP	- military construction program
MFH	- military family housing
MILCON	- military construction
MPOP	- minimum point of presence
NAF	- non-appropriated funds
NAVFACENGCOM	- Naval Facilities Engineering Command
NCC	- network control center
NEC	- National Electrical Code
NFPA	- National Fire Protection Association
NIPRNET	- Non-secure Internet Protocol Router Network
O&M	- operations and maintenance
PA	- programmed amount
PABX	- private automatic branch exchange
PE	- Program Element
RD	- Requirements Document
RJ	- registered jack
RPIE	- real property installed equipment
RST	- remote switching terminal
RTA	- ready to advertise
RX	- receive
SIPRNET	- Secure Internet Protocol Router Network
SLC	- single line (instrument) concept
STE	- secure terminal equipment
STEM	- system telecommunications engineering manager
STU	- secure telephone unit
TC	- telecommunications closet
TGB	- telecommunications grounding busbar
TIA	- Telecommunications Industry Association
TMGB	- telecommunications main ground busbar
TX	- transmit
UL	- Underwriters Laboratories
UPS	- uninterruptible power supply
USACE	- U.S. Army Corps of Engineers
USOC	- Universal Service Ordering Code
UTP	- unshielded twisted pair
VAC	- volt alternating current

## 7. Background.



**7.1.** Until the mid-1980s, the Air Force programmed, designed, and built new facilities through the MILCON process but added communications and information systems after construction completion. Installation of communications and information infrastructure after construction completion led to defacement of facilities and resulted in loss of flexibility since systems were not integrated into facility designs. Lack of synchronization between the facility and communication infrastructure delivery processes resulted in financial disconnects commonly resolved at the expense of other programs. Expensive occupancy delays were the norm.

**7.2.** Following the divestiture of the telecommunications industry in 1984, the Air Force adopted a policy called “prewiring.” The policy required the basic backbone infrastructure (outlets, wiring, CERs, telecommunications closets [TC]) to be integrated into the MILCON facility delivery process and financed with Appropriation 3300, Military Construction, Air Force. It did not include end instruments, telephone and network equipment, nor the connectivity needed to provide a dial tone and network access at the subscriber’s outlet at the time of facility beneficial occupancy. These items continued to be funded from Appropriation 3400, Operation & Maintenance, Air Force, or Appropriation 3080, Air Force Procurement (Equipment). The policy eliminated the potential for defacement of newly completed facilities during installation of communications infrastructure. It also provided enhanced flexibility through facility standardization. It did not, however, eliminate the potential for funding disconnects caused by fragmented funding sources nor resultant expensive occupancy delays.

**7.3.** In FY 2000, the President’s budget requested \$560 million for Air Force conventional MCP projects. Congress added to the Military Construction Appropriation Act \$254 million worth of projects that were not requested in the President’s budget; however, they did not increase the 3400 and 3080 appropriations by the amount necessary to buy communications equipment and connectivity for the additional buildings. Consequently, the Air Force faced a large financial disconnect in making the additional facilities usable. In November 1999, HQ USAF/ILE and HQ USAF/SC co-sponsored an Integrated Process Team (IPT) to study the facility delivery process and make recommendations that would ensure new facilities were “communications-ready” at the time of occupancy. During its investigations, the IPT also found that communication equipment and connectivity support funding had not been requested for a large percentage of the facility projects that the Air Force had requested in the President’s budget, thereby exacerbating the disconnect. Furthermore, the IPT found the timing of communication requirements identification was not synchronized with the facility delivery process. Therefore, the IPT recommended that all common-user communications and information system infrastructure costs be internalized to the MILCON appropriations. In May 2000, HQ USAF/ILE and HQ USAF/SC agreed to implement the recommendation; however, the Office of the Undersecretary of Defense (Comptroller) would not make the requested changes to Department of Defense (DOD) 7000.14-R, *DOD Financial Management Regulation*, which would enable the Air Force to buy communications and information equipment with funds appropriated for MILCON. HQ USAF/ILE therefore decided in January 2002 not to further pursue changing DOD financial management policy; this ETL was published only with the other IPT-

recommended process improvements aimed at mitigating funding disconnects along with the technical updates.

## **8. Specific Requirements.**

**8.1.** All mandatory requirements of the JTA-AF (AFI 33-133) must be met. The JTA-AF is available to .mil Internet clients on the Web at <https://www.afca.scott.af.mil/jta-af>. This ETL governs where conflicts exist with non-mandatory JTA-AF or with any Telecommunications Industry Association/Electronics Industries Alliance (TIA/EIA) technical requirements.

**8.2.** Installation of official base telephones and LAN service in NAF facilities, certain services facilities, certain types of quarters (including lodging), and unofficial or private facilities is strictly regulated. Install official service in these facilities only as authorized by AFI 33-111, *Telephone Systems Management* (for telephones), and AFI 33-115, *Network Management*, Volume 1 (for LANs). See paragraph 8.4 for quarters and lodging facilities requirements.

**8.3.** Office Facilities. Commercial and industrial facilities or portions of these facilities that accommodate normal office automation tasks (word processing, spreadsheets, database applications, email client, and Internet access) will meet the following:

### **8.3.1.** Wired LANs.

**8.3.1.1.** LANs will use switched Ethernet technology meeting the Ethernet and transmission media standards defined in JTA-AF, *Local Area Network Architecture*. Client jacks will be Category 5 (CAT 5)-rated or better Universal Service Order Code (USOC) registered jack (RJ)-45, wired with CAT 5 or better four-pair unshielded twisted pair (UTP) cable in accordance with TIA/EIA-568-B, *Commercial Building Telecommunications Cabling Standard*. Use the T568A termination configuration (or T568B by exception as permitted in this ETL). Terminate all client drops on CAT 5 or better-rated patch panels in TCs. Install Ethernet switches in TCs or the CER. Connect client drops from the patch panel to the supporting switch with CAT 5 or better-rated patch cables. Connect the single building-level switch or switch/router with the point where the building connects to the base campus area network (CAN) at an information transfer node (ITN) with 12-strand FOC. In buildings with multiple switches, interconnect workgroup-level switches and the single building-level switch or switch/router with FOC. Fiber optic multiplexing equipment will be installed and configured as may be required by the base command, control, communications, computers, and intelligence (C4I) blueprint. Technical guidance on Air Force LANs and CANs is available in the JTA-AF, *Information Technology Infrastructure Architecture*. Servers required to support new facilities will only be installed in the base network control center (NCC) or the ITN server consolidation location consistent with Air Force network consolidation goals.

**8.3.1.2.** Alternative technologies, such as asynchronous transfer mode (ATM)-based networks or wireless LANs, may be used where justified by operational requirements or economics and approved on a case-by-case basis by the MAJCOM/SC. Wireless LANs will not be used as a substitute for a wired LAN infrastructure in new facilities except in facilities such as hangers, aircraft maintenance facilities, and warehouses where mobility of client computers is essential to operational effectiveness. Include justification and approval for alternative technologies in the MCP programming documentation.

### **8.3.2. Telephone Systems.**

**8.3.2.1.** Single Line (Instrument) Concept (SLC). Telephone systems will implement the SLC and be capable of providing Integrated Services Digital Network (ISDN) services. Key systems will not be installed in new facilities. Terminate all subscriber lines in the new facilities, except point-to-point circuits such as fire alarms, on the facility telephone switch (private automatic branch exchange [PABX], remote switching terminal [RST], or other phone switch). New switching systems will meet mandatory requirements defined in JTA-AF, *Voice Switching Systems Architecture*. In small buildings where a separate switching system is not justified, extend all switched circuits to the base dial central office switch.

**8.3.2.2.** SLC Exception. Multi-line telephone or key system wiring may only be installed under special exception, justified on technical or economic grounds on AF Form 3215, **C4 Systems Requirements Document**, and approved by the MAJCOM/SC in accordance with AFI 33-111.

**8.3.3.** Building Wiring Architecture. Building telecommunications (telephone and LAN) distribution systems must meet TIA/EIA-568-B, TIA/EIA-569-A, *Commercial Building Standards for Telecommunications Pathways and Spaces*, TIA/EIA-606, *Administration Standard for the Telecommunications Infrastructure of Commercial Buildings*, and TIA/EIA-607, *Commercial Building Grounding and Bonding Requirements for Telecommunications*. Follow the general guidelines in JTA-AF, *Building Wiring Architecture*, Volume 6, available to .mil clients at <https://www.afca.scott.af.mil/jta-af/FixedBase/vol6/vol6.htm>. Where conflicts exist, this ETL governs. Distribution systems will be integrated into the design and construction of facilities and will be concealed. No exposed wiring will be permitted.

**8.3.3.1.** Distance Requirements. TIA/EIA-568-B allows a distance of 3 meters (10 feet) from the client outlet to the client end instrument (computer). It allows 90 meters (295 feet) from the client outlet to the TC. The cable length allowed in the closet is 7 meters (23 feet). Therefore, the total length of a client circuit must be no greater than 100 meters (328 feet).

**8.3.3.2.** CER. A facility that has significant communication systems requirements and is greater than 929 square meters (10,000 square feet) in area must have a CER. Unoccupied and/or small facilities such as guardhouses, utility control buildings, and

storage bunkers will typically not require a CER. The CER serves as the entrance facility for all incoming communications ducts and service and as the location for communication and information infrastructure such as the building PABX, RST, and LAN switches.

**8.3.3.2.1. Location, Sizing, and Details.** The CER will be located on the first floor along an exterior wall. It must be a dedicated space not shared with other functions (e.g., building electrical or mechanical utilities). As a minimum, the CER should have 19-millimeter (0.75-inch) plywood backboards on all walls, from no greater than 0.3 meter (1 foot) above the finished floor level to no less than 2.1 meters (7 feet) above the finished floor level. Provide 0.91-meter wide by 2.03-meter long (36-inch wide by 80-inch long) double-leaf (no center support) doors fitted with a lock to control access to the CER from inside the building. Floors, walls, and ceilings must be treated to eliminate dust. Finishes must be light in color to enhance room lighting. Provide telephone outlets for desk-mounted or wall-mounted telephones as appropriate. Do not locate the CER near other building utility rooms or generators that may cause electromagnetic interference with CER equipment or where moisture, gases, dust, or other contaminants may enter. The size of the CER, including space for equipment and service entrance facilities, must not be less than set out in Table 1. For more specific design guidance refer to TIA/EIA-569-A.

**Table 1. CER Sizing**

<b>Building Usable Area Square Meters (Square Feet)</b>	<b>CER Size Square Meters (Square Feet)</b>	<b>Number of 102-millimeter (4-inch) Entrance Conduits</b>
<1858 (<20,000)	37 (400)*	3
1858 to 9290 (20,000 to 100,000)	46 (500)	4
9290 to 18,580 (100,000 to 200,000)	84 (900)	5
Every additional 18,580 (200,000)	+56 (+600)	+1

**Note:** Not less than 2:1 ratio length to width.

\* Adjustments may be made for small buildings

**8.3.3.2.2. Power Requirements.** Provide a minimum of two dedicated un-switched 20-amp, 120-VAC, 60-Hz (or host country standard voltage and frequency) duplex receptacle power outlets, each on a separate branch circuit for communication equipment. Increase these minimum requirements as necessary to meet equipment loads. Support the equipment with UPS units where continuous equipment operation is required or where economically justified. Provide additional 120-VAC convenience outlets for maintenance and housekeeping. Back-up all electrical loads in the CER with standby generator power when justified.

**8.3.3.2.3. Environmental Requirements.** Provide heating, cooling, and fresh air appropriate for the equipment housed. Maintain a positive pressure inside the room to reduce the entry of dust. Normal operating ranges should be as locally established for employee comfort (typically between 20 to 26 °C [68 to 78 °F]). There are no special relative humidity requirements. Provide a minimum of 538 lux (50 foot-candles) of illumination measured 1 meter (39 inches) above the finished floor.

**8.3.3.2.4. Ground Connections.** Ground connections in the CER must meet National Fire Protection Association (NFPA) 70, *National Electrical Code* (NEC), and TIA/EIA-607 requirements. Provide a single-point ground for all communications/electronics equipment for the building within the CER. Provide a telecommunications main ground busbar (TMGB) (minimum of 152 millimeters high by 610 millimeters long [6 inches high by 24 inches long]) installed 2.1 meters (7 feet) above the floor on a wall (preferably an outside wall) within the CER. The ground riser from the ground plate to the single main electrical service entrance ground must be a No. 1 American Wire Gauge (AWG) or larger copper conductor directly connected to the ground plate with no taps. The resistance of the ground riser must be 5 ohms or less measured from the main building ground point. All connections of wire-to-wire and/or wire-to-ground rod must be exothermic-welded. Extend No. 6 AWG or larger copper ground wires from the CER ground plate to each TC within the building and connect a telecommunications grounding busbar (TGB) in the TC. Bond each TMGB and TGB to non-current-carrying metal building parts, such as metal framing, in the CER and TC as required by the NEC.

**8.3.3.2.5. Building Entrance Terminals (BET) (Telephone).** Provide gas protector modules in the CER to protect the inside plant wiring and equipment from voltage surges. Where the length of the outside plant cable from the point it enters the building to the BET is greater than 15 meters (50 feet), install the outside plant cable in metal conduit and ground the conduit. Terminate twisted-pair outside plant cable on BETs at the point where it enters the building. Provide cross-connects from the BET to the inside wiring connection point.

**8.3.3.3. TCs.** Provide a TC for each 929 square meters (10,000 square feet) of building area on each floor. The TC supports the functions outlined in TIA/EIA-568-B and serves to house the interface between the CER and client telephone and data outlets. It houses LAN networking equipment (e.g., Ethernet switches and patch panels) for client outlets served from the TC. A TC may serve as the CER for buildings less than 929 square meters in area.

**8.3.3.3.1. Location, Sizing, and Details.** TCs must be dedicated spaces not shared with other functions (i.e., building electrical or mechanical utilities). TCs must be located centrally in the area they serve and sized in accordance with TIA/EIA-569-A. Generally, the TC must be sized to approximately 1.1% of the area it serves. For example, a 929-square-meter (10,000-square-foot) area must be served by a minimum of one 10-square-meter (110-square-foot) TC. Under no circumstances will a TC be smaller than 6.5 square meters (2.1 by 3 meters) (70 square feet [7 by 10 feet]). TCs on

successive floors must be vertically stacked. A minimum of three 102-millimeter (4-inch) rigid steel conduits must be installed between stacked closets on successive floors in accordance with TIA/EIA-569-A. All conduit and other penetrations through fire-rated walls, ceilings, and floors must be fire-stopped in accordance with the NEC. As a minimum, the TC should have 19-millimeter (0.75-inch) plywood backboards on all walls, from no greater than 0.3 meter (1 foot) above the finished floor level to no less than 2.1 meters (7 feet) above the finished floor level. Floors, walls, and ceilings must be treated to eliminate dust. Finishes must be light in color to enhance room lighting. Provide a 0.91-meter wide by 2.03-meter long (36-inch wide by 80-inch long) single-leaf door hinged to open outward and fitted with a lock to control access to the room. Provide an outlet for a wall-mounted telephone installed near the entry door. Do not locate the TC near other building utility rooms or generators that may cause electromagnetic interference with TC equipment or where moisture, gases, dust, or other contaminants may enter.

**8.3.3.3.2. Power Requirements.** Provide a minimum of two dedicated un-switched 20-amp, 120-VAC, 60-Hz (or host country standard voltage and frequency) duplex receptacle power outlets, each on a separate branch circuit for communication equipment. Increase these minimum requirements as necessary to meet equipment loads. Support the equipment with UPS units where continuous equipment operation is required or where economically justified. Provide additional 120-VAC convenience outlets for maintenance and housekeeping. Backup all electrical loads in the TC with standby generator power where justified.

**8.3.3.3.3. Environmental Requirements.** Provide heating, cooling, and fresh air appropriate for the equipment housed. Normal operating ranges should be as locally established for employee comfort (typically between 20 to 26 °C [68 to 78 °F]). There are no special relative humidity requirements. Provide a minimum of 538 lux (50 foot-candles) of illumination measured 1 meter (39 inches) above the finished floor.

**8.3.3.3.4. Grounding.** All TCs must be connected to a single-point ground in the CER in accordance with TIA/EIA-607 (see paragraph 8.3.3.2.4).

**8.3.3.4. Equipment Racks.** Equipment racks must be 0.48 meter (19 inches) wide and mounted on the floor. Locate racks near the point where outside plant cable enters the building in CERs and center of the room in TCs. If mounting requirements for oversize equipment is anticipated, 0.58-meter (23-inch) wide racks may be substituted. In narrow or crowded closets, equipment racks may be mounted adjacent to a wall but must provide a minimum of 0.91 meter (36 inches) of space both in front and behind the rack. Where added physical protection is required for terminations, data equipment, and patching, 0.48-meter (19-inch) equipment cabinets may be used. Ground all racks and cabinets.

**8.3.3.5. Cable Rack.** Channel-type cable rack must be used in TCs and CERs to provide distribution raceway between telephone backboards, equipment racks, riser conduits, and distribution cable trays.

#### **8.3.3.6. Copper Cable Terminations:**

**8.3.3.6.1. Copper Distribution Cable Termination.** All copper distribution cable (riser cable and subscriber drops) used for telephone or data circuits must be terminated in TCs and the CER on 110-type CAT 5 or better rated termination patch panels mounted in an equipment rack. Terminations must be wired to TIA/EIA-568-B termination configuration T568A (default configuration); new facilities may be wired to terminal configuration T568B (by exception) only if required to maintain system uniformity or security. Telephone and data cables must not be intermingled; provide separate patch panels for each. On small installations where multiple patch panels are not justified, group telephone cables together and separate them from data cable groupings. Label all cables, patch panels, and terminations consistent with the building or the base overall cable management numbering system as required by the BCSO.

**8.3.3.6.2. Copper Telephone Patch Cables.** Telephone patch cables must be 4-pair No. 24 AWG stranded UTP and have a standard 8-pin/8-position USOC RJ-45 type connector on one end and a termination compatible with the incoming telephone circuit block or panel on the other end. It is highly recommended that telephone patch cables have the same category rating as data patch cables used in the facility to simplify housekeeping and inventory, and preclude the need to differentiate between two kinds of patch cables.

**8.3.3.6.3. Copper Data Patch Cables.** Data patch cables must be factory-assembled 4-pair No. 24 AWG stranded CAT 5 or better UTP and have a standard 8-pin/8-position USOC RJ-45 type connector on one end and a termination compatible with the incoming data circuit block or panel on the other end.

#### **8.3.3.7. FOC Termination.**

**8.3.3.7.1.** All FOC used for distribution must be terminated in rack-mounted patch panels. Duplex patch cables must be used. Termination of FOC in enclosed 0.48- or 0.61-meter (19- or 24-inch) cabinets to provide greater protection is recommended.

**8.3.3.7.2.** Fiber optic patch cables must be factory-assembled using single coupling SC-type FOC connectors except where other connector types are required to interface with existing equipment.

#### **8.3.3.8. Cabling and Wiring:**

**8.3.3.8.1. Horizontal Cable (Telephone and Data).** Horizontal cables connect individual subscriber telephone and LAN outlets to their respective 110-type patch panels in the TC. Horizontal cable for both telephone and LAN (data) must be 4-pair No. 24 AWG solid copper, 100 ohm, CAT 5 or better UTP cable. Use only cable that has passed the Underwriters Laboratory (UL) network certification program and is UL-listed and -labeled. Group telephone cables separately from LAN cables.

**8.3.3.8.2. Riser Cable (Telephone).** Telephone riser cables provide connection between the telephone patch panel in the TCs and the telephone patch panel or main distribution frame in the CER. Telephone riser cable must be multi-pair (sized as required to support all horizontal cables terminated in the TC plus 50% spare pairs) No. 24 AWG solid copper, 100 ohm, CAT 3 UTP cable. They must meet the requirements of TIA/EIA-568-B.

**8.3.3.8.3. Riser Cable (LAN).** Fiber optic network riser cables provide connectivity between the LAN workgroup-level switches in the TCs and the LAN patch panel in the CER. LAN riser cable must be 12-strand, 62.5/125-micron multi-mode FOC. The cable riser must be terminated in a patch panel with duplex SC-type connectors installed in an equipment rack or cabinet.

**8.3.3.8.4. Outside Plant Cable.** Telephone outside plant cable provides connection between the telephone main distribution frame or 110-type patch panel in the CER and the point where the facility connects to the base telephone network (typically the dial central office or an RST in another building). Data outside plant cable provides connection between the intra-building LAN main Ethernet switch/router and the point where the facility connects to the base CAN (typically the NCC or an ITN). Outside plant cable connectivity typically consists of both single-mode FOC (for data) and multi-pair metallic cables (for telephones) as specified in the base C4I systems blueprint; however, some buildings may require single-mode FOC connectivity for both functions. Outside plant single-mode FOC and metallic cable must meet the requirements specified in TIA/EIA-758, *Customer-Owned Outside Plant Telecommunications Cabling Standard*.

**8.3.3.8.4.1. Metallic outside plant cable** must be multi-pair sized as required to support the building circuit requirements (telephone lines, trunks, alarm and sensor circuits, and point-to-point communications circuits) coordinated with the base C4I systems blueprint plus a minimum of 10% spare capacity (50% is recommended). Capacity greater than 10% may be provided where approved by the MAJCOM.

**8.3.3.8.4.2. Single-mode FOC** must be used to provide data connectivity from the intra-building LAN switch/router or RST to the base CAN (typically at an ITN) or the base dial central office. Except where higher fiber strand count is specified in the base C4I systems blueprint, FOC must be single-mode, 12-strand cable.

**8.3.3.9. Standard Telecommunications Outlet.** The standard outlet must consist of two 8-pin/8-position CAT 5 or better modular USOC RJ-45 jacks mounted in a single faceplate (one jack for telephone and one for data use) in a factory-made assembly with (or collocated with) two duplex 120-VAC, 60-Hz (or host country standard voltage and frequency as applicable) power receptacles. Telephone and data jacks must be non-keyed unless the user requires keyed connectors to maintain system uniformity, security, or other user-specified reasons. The power outlet circuits must be based on a loading assumption that each location of two duplex receptacles will power one



personal computer with a monitor along with typical office appurtenances such as task lights; also assume that there will be no diversification of this load.

**8.3.3.9.1.** Standard outlets may contain blank faceplates or provisions for the future installation of FOC if approved by the MAJCOM. Outlets at select locations may also have a type "F" jack if required for CATV or closed circuit television (CCTV) as approved by the MAJCOM.

**8.3.3.9.2.** All administrative facilities (610 Category Code) and administrative spaces in other types of facilities must be equipped with one standard telecommunications outlet for each 4.5 square meters (48 square feet) of net office space. Outlet densities and locations for all special-purpose spaces and non-administrative facilities must be determined by the user and the BCSO and must follow the guidelines in TIA/EIA-569-A.

**8.3.3.10.** Pay Phone Outlet. Pay phone outlets must consist of one 8-pin/8-position CAT 3 or better modular USOC RJ-45 non-keyed jack in a single gang outlet faceplate. Locate pay phone outlets in common-use areas where required by the BCSO or Army & Air Force Exchange Service (AAFES) (the present pay phone service provider).

**8.3.3.11.** Furniture Systems Support Wiring. Although furniture systems are designed for quick reconfiguration of office space, experience has shown that furniture prewired with power and telecommunications connections cannot be reconfigured easily. Telephone and data wiring systems in areas with pre-wired workstations, furniture systems, or modular walls must have sufficient flexibility and connectivity to enable rearrangement without modifications to the permanent communications and data wiring in the facility. Suitable connectors must be provided; permanent splices/connections are prohibited.

**8.4.** Quarters and Lodging Facility Guest Rooms. This section applies to all quarters including MFH (junior enlisted housing, senior enlisted housing, company grade officer housing, field grade officer housing, and general officer quarters [GOQ]) and dormitories (unaccompanied enlisted personnel housing and unaccompanied officer personnel housing). It also applies to guest rooms and suites in billeting facilities (visiting officer quarters, visiting airmen quarters, and distinguished visitor quarters) and temporary lodging facilities.

**8.4.1.** Quarters are private domiciles, not alternate duty locations. Telecommunications service (dial tones and Internet access) in quarters is a private business matter between the housing occupant and the private telecommunications service provider. Lodging facility guest rooms are private occupancies. Telecommunications service in guest rooms is a private business matter between the occupant and the base Services Squadron who contracts with telecommunications service providers. Telecommunication services, including dial tone, Internet access, and CATV service, must not be funded in these facilities with appropriated money nor will they be connected to base official telecommunications networks except as follows:

**8.4.1.1.** Senior officers who are commanders having legal command and control authority (MAJCOM, numbered Air Force, and wing commanders) may be authorized command and control circuits in their personal quarters under certain conditions (see AFI 33-111, Attachment 2). In such conditions, wiring may consist of a circuit for a STU and a circuit for access to the base CAN. These installations must meet the technical requirements of this ETL. These requirements are in addition to private telecommunications service circuits.

**8.4.1.2.** USAF Academy cadet dormitory quarters must be wired with one circuit for each student in each room to allow access to the student LAN.

**8.4.1.3.** Permanently installed jacks, wiring, raceways/pathways, and connectivity to base networks in new construction for the exceptions in paragraphs 8.4.1.1 and 8.4.1.2 (MFH units, GOQs, student dormitories) will be funded with MILCON appropriations for the new construction. In existing quarters, installation, repair, and maintenance of permanent wiring and jacks must be funded only with funds appropriated for housing (Public Law [PL] 106-52, *Military Construction Appropriations Act, 2000*, Section 128) and are subject to the statutory funding limits applicable to housing.

**8.4.2.** Following the divestiture of the telecommunications industry in 1984, the Air Force has owned the inside wiring in quarters and lodging facility guest rooms from the subscriber's jack to the demarcation point where the wiring connects to the telecommunication service provider's network (usually at the outside wall of the quarters). At bases that have acquiesced with the service provider to a base minimum point of presence (MPOP), the government owns the wiring from the subscriber outlet to the MPOP (the central demarcation point is usually at the base dial central office). The cost of customer jacks, all permanent wiring, and raceways/pathways up to the service provider's network interface needed for private telecommunications services in quarters and lodging facility guest rooms will be included in the MILCON program funding for new facilities. On O&M-funded projects, these requirements must be funded only with housing funds (PL 106-52, Section 128) and are subject to the statutory funding limits on housing.

**8.4.3.** All jacks and wiring in housing and lodging guest rooms must comply with TIA/EIA-570-A, *Residential Telecommunications Cabling Standard*, except for the circuits described in paragraph 8.4.1.

**8.4.3.1.** Premises Wiring.

**8.4.3.1.1.** All wiring must be concealed.

**8.4.3.1.2.** Telephone wiring inside quarters and lodging facility guest rooms must be 4-pair No. 24 AWG solid copper, CAT 3 or better UTP cable.

**8.4.3.1.3.** CATV wiring must be 75-ohm coaxial cable terminated with type "F" connectors and jacks.

**8.4.3.2. Outlets.** Telephone and CATV outlets must be wall-mounted. See Air Force housing design guides (published by HQ USAF and MAJCOMs) and the *Air Force Visiting Quarters Design Guide* (published by Headquarters Air Force Services Agency, Lodging Department [HQ AFSVA/SVOHL]) for additional information on quarters and lodging facility guest rooms. Locate outlets or provide additional outlets to enable maximum furniture placement flexibility.

**8.4.3.2.1. Quarters.** Telephone outlets must consist of 4-pin/4-position non-keyed CAT 3 or better modular USOC RJ-11 jacks. CATV outlets must be “F”-type jacks. Locate jacks in the kitchen, living room, family room, and all bedrooms adjacent to a 120-VAC, 60-Hz (or host country standard voltage and frequency as applicable) duplex electrical receptacle.

**8.4.3.2.2. Lodging Facility Guest Rooms.** Telephone outlets must consist of 4-pin/4-position non-keyed modular USOC RJ-11 jacks. Locate one of the jacks in each room at the location of the guest’s desk adjacent to a 120-VAC, 60-Hz (or host country standard voltage and frequency as applicable) duplex electrical receptacle, both wall-mounted above the top of the desk so guests can conveniently access them with laptop computers. MAJCOMs may, at their discretion, require the outlet at the guest’s desk location to consist of two RJ-11 jacks, one labeled “TELEPHONE” and one labeled “DATA,” mounted on a single faceplate with each jack wired separately to the billeting telephone and Internet protocol switching equipment. CATV outlets must be “F”-type jacks.

**8.5. Telecommunications System Management Records.** Telecommunications system labeling, management records, and drawings must comply with TIA/EIA-606. Existing base standard numbering practices may be used as long as they incorporate the following requirements: all outlets, patch panel positions, and cables must be labeled as to their function with a unique identifier code; and as-built drawings and management records must show the location of all outlets, equipment, and cabling. These records must be provided as a deliverable item under any construction procurement contract. They will form part of the base Communications and Information Systems Installation Records (CSIR) and must be delivered to the BCSO CSIR manager upon contract completion according to AFI 33-104, *Base Level Planning and Implementation*, and AFI 21-404, *Developing and Maintaining Communications and Computer Systems Installation Records*.

**8.5.1. Outlets and Patch Panel Labeling.** As a minimum, outlet and patch panel labeling must show the TC number serving the outlet and the outlet circuit number. The outlet number should reflect its relative physical location in the building. Circuit numbers should not incorporate telephone extension numbers since telephone numbers can be reassigned to different outlets in telephone switching equipment and are therefore subject to frequent change. Where several patch panels are located in a single TC, the numbering and labeling scheme must also show the number of the patch panel serving the outlet. Each individual jack must be labeled to show its function; top

or left jack position must be designated for and labeled "PHONE," and bottom or right jack position must be designated for and labeled "DATA." All patch panels terminating copper cable must be stenciled with the panel number, the cable count, and whether terminations are wired to TIA/EIA-568-B termination configuration T568A (default) or T568B (by exception only) wiring standard. Fiber optic ports in patch panels must be labeled to show the transmit "TX" and receive "RX" port for each duplex set of fibers. Lettering on labels must be 6 millimeters (0.25 inch) high and machine-made; handwritten labels must not be used for permanent installation.

**8.5.2. Distribution System Labeling.** All transitions and changes in distribution system size and type must be labeled on the as-built drawings. Each cabinet must be labeled at the top with a unique designation. All cables, patch panels, and cable terminations must be labeled.

**8.6. Telecommunications Switching, Network, and Other Equipment Acquisition.** The MAJCOMs must determine the best equipment procurement and installation method for each project based on specific project requirements considering the facility delivery schedule, equipment availability, cost, installation quality control, and standardization for O&M, among other factors (see paragraph 1.1.2).

**8.6.1.** Equipment may be procured through standard contracts such as General Services Administration (GSA) Federal Supply Schedules, or omnibus contracts as managed by the 38 EIG (Air Force Materiel Command [AFMC]), Tinker Air Force Base, Oklahoma, or other standard supply contracts. It may be installed through standard supply contracts (that include such services), separate installation contracts, Air Force organic labor, or through military construction contracts. Standardized supply contracts have some advantages: there are usually price advantages since the contracts were competed on a volume basis; and products are standardized, which has favorable O&M implications.

**8.6.2.** Equipment and its installation, including any system engineering, may be bought through the project's MILCON contract but will not be funded with construction appropriations. If procured through the construction contract, the MAJCOM places the design and construction Agent in charge of system delivery. While this approach may have scheduling advantages, it also may have cost and standardization drawbacks. Where this approach is used, the MAJCOM/SC will provide equipment and installation technical specifications in the appropriate construction agent specification format, prepared by the base or MAJCOM STEM, to the project's MAJCOM design manager. The design manager will provide them to the design agent.

**8.6.3.** It should be recognized that equipment such as new telephones, instruments, and personal computers may be needed for a new facility, and, if so, the project's sponsoring MAJCOM must program, budget, and pay for them in accordance with AFI 65-601V1. Furthermore, other equipment may be required to make the new facility usable for the purpose for which the military construction (3300) funds were appropriated. For example, a satellite earth station system may need to be bought for a

facility that was appropriated to house it. These kinds of systems or equipment are usually bought through a centrally managed program. The construction project's sponsoring MAJCOM must make sure equipment is bought and installed in the facility.

**8.7. Testing.** All metallic and fiber optic cabling must be tested end-to-end and certified to meet TIA/EIA performance standards. All equipment must be tested to meet contract specifications. All test results and certifications must be provided in a report upon completion of construction to the BCSO responsible for system O&M.

## **9. Responsibilities.**

**9.1. General.** The successful delivery of a facility requires the careful teamwork of many organizations including the end user, BCE, BCSO, MAJCOM/CE and SC, base and MAJCOM STEM, design and construction agent (U.S. Army Corps of Engineers [USACE], Naval Facilities Engineering Command [NAVFACENGCOM], or MAJCOM), and perhaps others. MAJCOMs have complete responsibility for their projects. Usually the end user and base hosting the new facility are within the same MAJCOM; however, that is not always the case. Since accountability always goes with the money, the MAJCOM sponsoring the MILCON project must carry complete responsibility for all facets of the project from requirement definition through delivery of a complete and usable facility.

**9.2. MCP Programming.** The process of programming MILCON projects is a unique subset of the Air Force planning, programming, and budgeting process. See the *USAF Project Manager's Guide for Design and Construction* for process time lines.

**9.2.1.** Upon BCE validation of the customer's requirement for the proposed project and initiation of project development in preparing the DD Form 1391, **Military Construction Project Data**, the BCSO and customer will assist the BCE in the development of communications requirements and costs. Upon approval of the proposed project by the base Facilities Board, the BCE will notify (courtesy copy of the DD Form 1391) the BCSO, who, in turn, will confirm the communications requirements and costs.

**9.2.2.** The BCSO, working with the base and MAJCOM STEM and end user, must define communications requirements in writing and develop programming costs for inclusion on the DD Form 1391 which will go to Congress. The DD Form 1391 forms the basis for each project's MILCON appropriation. The front page of DD Form 1391 must show in block 9 both the "Primary Facility Cost" (with a line item reflecting all "Interior Communications Support" infrastructure costs) and the "Supporting Facility Costs" (with a line item reflecting all "Exterior Communications Support" infrastructure costs). The interior communications support and supporting facility costs will be funded with MILCON appropriations in accordance with paragraph 1.1.1. The DD Form 1391 must also show line items for all required communications infrastructure (see paragraph 1.1.2) to make the facility complete and usable as intended but funded with other appropriations (3400 and 3080). Show these costs by appropriation in block 13 under "Equipment from Other Appropriations" on the DD Form 1391. Refer to the annual HQ

USAF/ILE military construction call letter and MAJCOM supplemental guidance for specific instructions on completing and submitting all MILCON project documentation.

**9.2.3.** In response to the HQ USAF/ILE and MAJCOM/CE annual military construction call letter (typically issued in the spring two to three years in advance of the MCP target FY) the BCE will submit candidate projects to the MAJCOM in accordance with the call letter's instructions. Submitted projects must include the BCSO and wing commander's signatures on the Certificates of Compliance certifying the sufficiency of the communications infrastructure requirements and costs (both construction and equipment) shown on the DD Form 1391. Certificates of Compliance will be prepared on DD Form 1391C, **Military Construction Project Data (Continuation)**, and submitted with each project in accordance with the call letter's guidance.

**9.2.4.** The MAJCOM/SC will certify on the Certificates of Compliance the sufficiency of the communications infrastructure requirements and costs (both construction and equipment) shown on the project's DD Form 1391. The AF MCP call letter prescribes the exact submittal due date, but submittals are typically required to arrive at HQ USAF two to three years in advance of the MCP target FY. The MAJCOM/SC must program and budget for all communications infrastructure required to support new construction projects (see paragraphs 1.1.2 and 3) and ensure the funds are available in the year they are required to make the facility complete and usable when construction is complete.

**9.2.5.** The MAJCOM/CE must notify the BCE and MAJCOM/SC of any change in project status such as change in fiscal year or project approval/disapproval. The BCE must notify the BCSO.

**9.3.** Design. Signaling the beginning of the design phase, HQ USAF/ILE will issue a Planning Instruction to the MAJCOMs for those projects that will be included in the President's budget. This typically occurs two years in advance of the MCP target FY. In response, MAJCOMs and their bases develop a Requirements Document (formerly called Requirements And Management Plan - RAMP) for each project. The RD outlines the project's technical requirements and management strategy. It guides the MAJCOM design manager and the Army or Navy design agent through the design process and facility delivery. The Air Force typically requires MAJCOMs to have completed 35% of the design one to two years in advance of the MCP target FY. At that time, the Air Force also requires MAJCOMs to amend (if necessary) and re-certify the project's programmed amount (PA) on the DD Form 1391, based on completion of requirements discovery occurring up through the 35% design completion point. This is the last opportunity to make any minor corrections to the project's PA that may be needed to ensure the project will be executable before the DD Form 1391 is sent to Congress.

**9.3.1.** The BCSO, BCE, base STEM, MAJCOM/SC, MAJCOM STEM and user will cooperate to develop the project's RD. The BCSO and MAJCOM/SC must coordinate on the RD before the MAJCOM design manager releases it to the design agent.

**9.3.2.** Since it is illegal to augment an MCP project's construction appropriation with other appropriations, it is imperative that the project's PA be accurate and sufficient to execute the project before Congress appropriates funds. Therefore, the MAJCOM/SC will re-certify the project's communications costs that are part of the construction project's PA and the supporting communications infrastructure costs shown as "Equipment from Other Appropriations" on the DD 1391 at the 35% design completion point before the MAJCOM design manager reports the final PA to HQ USAF/ILE.

**9.3.3.** The MAJCOM design manager must notify the BCE and MAJCOM/SC of any change in project status or milestones. The BCE must notify the BCSO. Likewise, the MAJCOM/SC must notify the MAJCOM design manager and the BCSO of any changes that may impact the project. The BCSO must notify the BCE.

**9.3.4.** The MAJCOM design manager must ensure that qualified and experienced firms prepare communications and information infrastructure designs provided through the design and construction agents. Communications distribution designer registration is highly desirable (e.g., Building Industry Consulting Services International (BICSI); see <http://www.bicsi.org/index.htm>).

**9.3.5.** The MAJCOM design manager must include all concerned parties (as a minimum, the BCSO and base STEM) in all project design reviews and incorporate their comments into the designs as appropriate.

**9.3.6.** The Air Force requires MAJCOMs to have MCP project designs complete and construction contracts ready to advertise (RTA) by 1 October of the project's appropriation FY.

**9.3.7.** The MAJCOM design manager must ensure all designs adhere to the policies and criteria contained in this ETL.

**9.4.** Construction. HQ USAF/ILE will issue the authority to advertise once the project is RTA and funds for the MILCON project have been appropriated.

**9.4.1.** The MAJCOM construction manager must notify the BCE and MAJCOM/SC of any change in project status or milestones. The BCE must notify the BCSO. Likewise, the MAJCOM/SC must notify the MAJCOM construction manager and the BCSO of any changes that may impact the project. The BCSO must notify the BCE and base STEM.

**9.4.2.** The MAJCOM construction manager must ensure that communications and information infrastructure provided through construction contracts is installed by qualified and experienced firms. Include telecommunications installer qualifications and experience requirements in the project's contract.

**9.4.3.** The MAJCOM construction manager, upon construction completion, must ensure a separate document is prepared for turnover of non-real-property communications and information infrastructure to the BCSO who has O&M responsibility. Communications

and information infrastructure must not be transferred on DD Form 1354, **Transfer and Acceptance of Military Real Property**. The communications and information infrastructure title transfer document must be in the form of a letter and must identify the quantity, description, part number, and serial number of all infrastructure installed. The construction agent and BCSO commander, or authorized representative, must sign the document with the BCSO as receiving agent. The BCSO must make sure all accountable assets are recorded in the Air Force Equipment Management System (AFEMS) or Information Processing Management System (IPMS), as applicable.

**9.4.4.** The MAJCOM construction manager must ensure two copies of shop drawings, maintenance manuals, as-built drawings, cable labeling and management records, and test reports are turned over to the BCSO when the facility is transferred from the construction agent to the Air Force. The BCSO must make one copy available to the base STEM.

**9.4.5.** The BCE is responsible for processing warranty claims for anything that was acquired and installed under the construction agent's contract. The BCSO will validate warranty claims for communications and information infrastructure before they are submitted to the BCE for processing.

**9.4.6.** The BCE will be responsible only for the operation, repair, maintenance, and ownership of those items (structural, architectural, mechanical, or electrical) that are traditionally classified real property or RPIE.

**9.4.7.** The BCSO (or the using agency, depending on host/tenant agreements) will be responsible for operation, repair, maintenance, modification, upgrades, and ownership of all communications and information infrastructure.

**10. Technical Assistance.** Contact the MAJCOM and base STEMs for technical assistance. HQ AFCESA and HQ AFCA can assist MAJCOMs and design agents in applying ETL policy requirements. AFCESA, AFCA, and STEM assistance is most beneficial at the project requirements definition and programming stages.

#### **11. Points of Contact:**

**11.1.** For AFCESA: Mr. Al Day, HQ AFCESA/CESM, 139 Barnes Drive, Suite 1, Tyndall AFB, FL 32403-5319, DSN: 523-6357, and commercial (850) 283-6357, email: [alvin.day@afcesa.af.mil](mailto:alvin.day@afcesa.af.mil).

**11.2.** For AFCA: Mr. Wayne E. Grewe, HQ AFCA/CCQM, 203 W. Losey Street, Room 3200, Scott AFB, IL 62225-5222, DSN 779-6489 and commercial (618) 229-6489, email: [wayne.grewe@scott.af.mil](mailto:wayne.grewe@scott.af.mil).

**11.3.** This ETL is available on the AFCESA Website at <http://www.afcesa.af.mil/Publications/ETLs/default.html>.

MICHAEL J. COOK, Colonel, USAF  
Director of Technical Support

Atch:  
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